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ABSTRACT

A large sample of entering freshmen men and women at the Pennsylvania State University completed the Jackson Vocational Interest Survey (JVIS) during orientation. The instrument's 34 scores together with SAT math and verbal scores were analyzed in a stepwise discriminant function procedure with groups defined by the students' initial choice of academic college. Data for men and women were analyzed separately since two initial college groups were collapsed in a way that made the final sets of groups different for men and women. For men, SAT math and verbal scores and 21 JVIS scales were identified as contributing to group discrimination. For women, SAT math and 19 JVIS scales were similarly identified. These variables accounted for nearly 80 percent of between-groups variation. Classification functions correctly predicted actual college enrollment at a rate of about 60 percent for both men and women. Jackknifed classification functions were at about 55 percent for men and about 53 percent for women, indicating substantial stability in cross-validation. The JVIS is seen as promising for providing vocational counselors with an instrument that offers a sound alternative to vocational interest instruments currently on the market. (Author/MSE)

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Predicting Choice of Academic College from JVIS Scores of College Freshmen

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PREDICTING CHOICE OF ACADEMIC COLLEGE FROM JVIS SCORES OF COLLEGE FRESHMEN

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Abstract

A large sample of entering freshmen men and women at the Pennsylvania State University completed the Jackson Vocational Interest Survey (JVIS) during orientation. The 34 scores together with SAT math and verbal scores were analyzed in a stepwise discriminant function procedure with groups defined by the students' initial choice of academic college. Data for men and women were analyzed separately since two initial college groups were collapsed in a way that made the final sets of groups different for men and women. For men, SAT math and verbal scores and 21 JVIS scales were identified as contributing to group discrimination. For women, SAT math and 19 JVIS scales were similarly identified. These variables accounted for nearly 80 percent of between groups variation. Classification functions correctly predicted actual college enrollment with a hit rate of about 60 percent for both men and women. Jackknifed classification functions had a hit rate of about 56 percent for men and about 53 percent for women, indicating substantial stability in a cross-validation sense. The JVIS is seen as promising in terms of providing vocational counselors with an instrument that offers a sound alternative to vocational interest instruments currently on the market.

Predicting Choice of Academic College from JVIS Scores of College Freshmen

A considerable research effort has been marshalled in the area of student vocational interest. Of the three most widely researched instruments, two have been developed using criterion groups and which provide scores for a large number of occupational or curricular groups (Kuder, 1966; Strong, 1966). The Strong Vocational Interest Blank (SVIB) has been revised to provide 22 basic interest scales as well. The Kuder Occupational Interest Survey (OIS) uses ipsative scoring exclusively while the SVIB items include a combination of forced choice ranking and "like-dislike" formats. Holland's Vocational Preference Inventory (VPI) (1965) and Self Directed Search (SDS) (1971) are based on a theoretical typology of six personal orientations and consist of occupational titles, activities, and abilities with "like-dislike" or "yes-no" responses.

A more recent entry into this field is the Jackson Vocational Interest Survey (JVIS) (Jackson, Note 1), an instrument composed of 34 scales representing dimensions of work styles and occupational roles. The instrument was developed using statistical and rational strategies rather than being criterion referenced. Specifically, the procedures involved: "... (a) carefully defining dimensions of occupational roles and work styles and preparing a large set of items for each scale; (b) administering these items to a large sample of respondents and factoring the resulting correlation matrix of scale scores, statistically removing the influence

of response bias in the factor score matrix; (c) refactoring the matrix and obtaining orthogonal factor scores for each subject on each factor; (d) using these factor scores as a basis for conducting an item analysis; (e) subjecting the surviving items to an algorithm for minimizing average inter-scale correlation; (f) use of an algorithm for pairing items on the basis of endorsement frequency" (Jackson and Williams, 1975, p. 271).

Jackson and Williams further describe the JVIS scales as "... somewhat paralleling in content the SVIB basic scales, but broader in scope" and being distinctive by virtue of "... their having been developed from a large item pool prepared explicitly for particular scale definitions based upon occupational roles and work styles" (1975, p. 271).

Relationships Among Interest Scales

The SVIB, VPI, OIS, JVIS scales, as well as scales of other vocational interest instruments, probably all span some portion of a common space (see Cole and Hanson, 1971; Holland and Nofziger, 1975; Navran and Kendall, 1971; Haase, 1971). But factors such as sampling error associated with criterion groups, scoring conventions, and scale development strategies all tend to produce empirically determined relationships among the instruments that are somewhat inconsistent and confusing. Correlations among similarly defined scales on the OIS and SVIB tend to be quite small, indicating that these purportedly common scales may in fact be measuring different concepts (Wilson and Kaiser, 1968; Zytowski, 1968; O'Shea and Harrington, 1971). Rezler (1967) reported rather low correlations between the VPI scores and scores on the Kuder Preference Record-

Vocational, an instrument using the same format and methodology as the OIS but which measures 10 general dimensions of vocational interests. Recently, subsets of SVIB items have been used to operationally define the six Holland types for men (Campbell and Holland, 1972) and for women (Hanson and Johansson, 1972). However, these studies use a rational procedure to align SVIB items to Holland Scales, but do not report whether VPI or SDS scores correlate empirically in any meaningful way with SVIB derived VPI scales. Preliminary evidence (Fullerton, Note 2) suggests that these relationships are not strong, indicating that the six Holland types would be different depending on the particular instrument used. Most recently, Jackson and Williams (1975), using factor analytic techniques, have examined the relationships of JVIS profiles to SVIB occupational group profiles for men. The empirical basis of this comparison was the responses of nearly 550 men to both the SVIB and a preliminary version of the JVIS. Analysis of predicted JVIS profiles for the 189 SVIB occupational groups resulted in clusters of occupations that were clear and logically consistent as well as being generally representative of the SVIB basic interest scales. However, the clusters of occupational groups based on the predicted JVIS profile seemed to isolate more internally consistent families of occupations.

Perhaps somewhat more important than establishing common scale definitions is the need for vocational interest assessment instruments to demonstrate predictive efficiency. The purpose of this study is to examine the predictive efficiency of the JVIS in relation to initial choice of academic college of a sample of new baccalaureate degree freshmen men and

women at the Pennsylvania State University. As such, this study represents the first in a series of reports which will examine the predictive efficiency of the JVIS over time.

Predictive Efficiency of Interest Inventories

A number of investigators have examined how well vocational interest inventories predict college students' major field of study. In a study of National Merit Scholarship finalists, Holland (1962) found that pre-college VPI scores correctly predicted second year major field grouped according to Holland's typology for only about one third of the men and about one fourth of the women in his sample. For another sample of National Merit Scholarship finalists (Holland, 1963), prediction of senior year major field was somewhat poorer when predicted major field, grouped according to the Holland typology, was operationally defined by selected pre-college SVIB scale scores. In this latter study fewer than one third of the men and women were correctly classified. With a large sample of typical college students, Holland (1968) found that pre-college VPI scores correctly predicted major field after eight months at rates that ranged between 21.5% and 51.4% for men and 0% to 81.9% for women. In contrast, initial choice of major field correctly predicted major field eight months later at rates between 63% and 71.2%, leading Holland to suggest the use of initial choice of vocation rather than VPI scores in further research.

Although Holland has failed to predict later major from his vocational interest data, other researchers have had more success using different instruments. Baggaley and Campbell (1967) predicted

senior year major from freshman SAT math scores, SAT verbal scores, and six interest variables for a large sample of male and female undergraduates at one university. Stahmann (1969) also predicted senior year major from nine freshman achievement test scores and nine scores from an interest inventory. Both studies predicted senior year major with some accuracy. The former study reported an index of discrimination (Wilks' Lambda) of .20 where 1.00 indicates no inter-group discrimination and 0.0 reflects perfect discrimination. The latter study reported a correct prediction rate of about 50% for men and 58% for women.

In a more limited study, Scott and Sedlacek (1975) differentiated among three groups of men categorized into physical science, engineering, and "other" groups based on major at the end of the second year using freshman scores on the VPI and the California Personality Inventory (CPI). While the group differences were statistically significant, the Wilks' Lambda was only .80 for the CPI and .72 for the VPI, indicating a rather poor level of discrimination. Of course the use of only three groups partially accounts for this. A more recent study reported by Gottfredson and Holland (1975) predicted college students' choice of major classified according to Holland's typology from freshman scores on the SDS. For men the SDS scores predicted major group classified into Holland's typology somewhat better than chance with some erosion of predictive efficiency over time. In contrast, the predictions for women were slightly less than chance expectation. As with research on the VPI, Gottfredson and Holland found intended choice of major to be a better predictor of later choice than either the summary score or subscores on the SDS. There is

some indication that a more conventional grouping of majors, as compared with Holland's six types, produces stronger relationships with the personality characteristics of changers and persisters (Yonge and Regan, 1975). Based on this information, it seems likely that instruments allowing a more differentiated classification of majors will also demonstrate a higher predictive efficiency.

Borgen (1972) has demonstrated this phenomenon in a study using pre-college SVIB scores to predict senior year major for a large sample of male National Merit Scholars. SVIB occupational scales correctly predicted membership in one of nine groups of majors at a rate of 54%. Wilks' Lambda varied between .23 and .26, depending upon whether 10 categories of intended career or 16 major groups were predicted and whether the SVIB occupational or basic interest scales were used as predictors. The highest rate (47.4%) of direct hits in the discriminant analysis was obtained predicting 10 groups of intended career from the 22 basic interest scales. The hit rate ranged between 69% and 76%, well above chance, in predicting a science versus non-science dichotomy.

There appears to be a demonstrable relationship between measured interests at college entrance and later choice of major or career fields, especially when majors or career fields are grouped in a traditional way. The extent to which the JVIS can improve upon or meet the success of other instruments in this area is the problem investigated here.

Method

In the Fall 1974 the JVIS was given during orientation week to 1054 men and 845 women entering the Pennsylvania State University, University

Park campus, as new freshmen. Of these, 991 men and 797 women were admitted to one of the following ten academic colleges of the University: Agriculture (AG), Arts and Architecture (AA), Business (BUS), Education (EDUC), Health and Physical Education (HPE), Human Development (HDEV), Liberal Arts (LA), Engineering (ENGR), Earth and Mineral Sciences (EMS), and Science (SCI). The distribution of the sample among colleges for men and women is given in Table 1 together with the expected distribution

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Insert Table 1 about here

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based upon total enrollment. Since the sample comprises nearly two thirds of all new students, it is not surprising that it is generally representative of enrollment for both men and women. Even though the sample is representative, the number of men enrolling in Health and Physical Education and women enrolling in Earth and Mineral Sciences is small. However, these groups were found to be indistinguishable from those in Education and Engineering respectively and were merged (ED-HPE for men and EMS-ENGR for women), leaving nine derived groups of majors for both men and women. Preliminary analysis also revealed substantial differences between the responses of men and women. For this reason, and because the derived groups are not the same for men and women, the analyses are conducted separately for each sex.

It is important at this point to recognize that overlap exists in the programs of study offered in the academic colleges. For example, architecture related programs are offered in both Engineering and Arts and Architecture, business related programs are offered in Agriculture as well

as Business, and psychology programs are offered in Human Development, Liberal Arts, and Education. But, since students register for their first year in an academic college and not a major program, no alternative is left to accepting these somewhat ill-defined groups for this study.

The JVIS yields a score for each of the following 34 scales: (1) Creative Arts (C ARTS), (2) Performing Arts (P ARTS), (3) Mathematics (MATH), (4) Physical Science (P SCI), (5) Engineering (ENGR), (6) Life Science (L SCI), (7) Behavioral Science (B SCI), (8) Adventure (ADVENT), (9) Nature-Agriculture (NAT-AG), (10) Skilled Trades (SK TRDS), (11) Personal Service (P SERV), (12) Family Activity (FAM ACT), (13) Medical Service (MED SERV), (14) Dominant Leadership (LDSHP), (15) Job Security (JB SEC), (16) Stamina (STAM), (17) Responsibility (RESP), (18) Teaching (TCHNG), (19) Social Service (SOC SERV), (20) Elementary Education (EL ED), (21) Finance (FIN), (22) Business (BUS), (23) Office Work (OFC WK), (24) Sales (SALES), (25) Supervision (SUPER), (26) Human Relations Management (HUM REL), (27) Law (LAW), (28) Professional Advising (P ADV), (29) Author-Journalism (AUTH-JOURN), (30) Academic Achievement (AC ACH), (31) Technical Writing (TECH WRTNG), (32) Independence (INDEP), (33) Planfulness (PLAN), (34) Self Confidence (SELF CONF). In addition to these 34 variables, SAT math and verbal scores are included in the independent set since there is some indication that academic ability measures may be more important than vocational interest variables in predicting choice of vocation among high school students (Cooley and Lohnes, 1968). However, this effect seems to be somewhat less important in predicting college students' choice of major (Baggaley and Campbell, 1967; Berdie, 1955). Inclusion of these two

variables allows a direct examination of the relative influence of vocational interest and aptitude measures in the prediction of choice of academic college.

The JVIS items require a forced choice of preference for two alternative activities and each item is scored on only two scales with the key reversed for one of the scales. This partially ipsative nature of the instrument does introduce some correlation among scales that is a product of the methodology, but only items were selected that would minimize inter-scale correlations (Jackson, Note 1). Scales one through 17 and scales 18 through 34 have no items in common within sets, but there is of course complete duplication of items between the two sets of scales. The nature of the item overlap is such that each scale in the first set of 17 scales has only one item in common with each scale in the second set of 17 scales. In spite of the ipsative nature of the scales, the average absolute value of the inter-scale correlations between the two sets is less than .30. The average absolute value of the correlations among scales within each set is about .20, indicating that the scales measure relatively distinct constructs.

Stepwise discriminant analysis was used to analyze the data. Initial choice of academic college made by new students is the dependent variable and the 34 JVIS scales together with the math and verbal scores from the SAT constitute the initial independent variable set. The analysis uses the P7M subprogram of the biomedical series of programs (Dixon, 1975).

The purpose of the stepwise procedures is to identify a subset of the independent variables that optimally contributes to group separation.

While several proposals have been made regarding variable selection, different strategies have not been extensively evaluated so no one method can be advocated (Huberty, 1975). The item selection used here involves identification of variables that make the largest "independent" contribution to group separation. Independence here is construed to mean accounting for the largest amount of the residual variance left after the effect of all entered variables is removed. The first variable selected is the one with the largest univariate F or equivalently the smallest value of Wilks' Lambda. Succeeding steps select variables that account for the largest amount of the residual variation. A variable is removed if the F ratio reflecting its independent contribution to discrimination falls below the criterion value at a step after initially entered. Since this study is exploratory in nature, all variables are included that make an "independent" contribution to discrimination having an associated F statistic equal to or larger than 1.94. This value corresponds to the 5 percent level of probability in the univariate case.

The approach to cross-validation taken here is also somewhat at variance with customary procedures. Normally a proportion, say one third, of the sample is held out for cross-validation. Discriminant functions calculated on the remaining two thirds of the sample are then used to predict group membership in the cross-validation group. One disadvantage of this procedure is that the best estimate of classification functions which is based on all available data is not used. Furthermore, when some groups have relatively small N, as in this study, the traditional approach to

cross-validation can result in unstable estimates of classification functions for smaller groups.

Recently Mosteller and Tukey have discussed the use of the jackknife in relation to cross-validation in discriminant function analysis (1968, p. 154). The jackknife in this context assesses the effect of each case on the entire sample by withholding each case from the calculation, one at a time, and then treating the multiple results of this procedure in a way that facilitates the particular analysis. The jackknifed classification functions in this study are used to determine the predicted group membership of each omitted case. The effect of this procedure is to produce N pseudo cross-validation samples each containing one case. The stability of classification is thus estimated without the loss of information occasioned by withholding a sizeable proportion of the sample solely for cross-validation (see also Huberty, 1975, p. 576).

Results

Insert Tables 2 and 3 about here

Descriptive Statistics

Means and standard deviations for all 36 independent variables are presented in Tables 2 and 3 for males and females respectively. An examination of Table 2 gives an indication of how the JVIS scales differ among the colleges. For example, students enrolling in Agriculture have high scores on the Nature-Agriculture and Life Sciences scales. Arts and Architecture students are high on the Creative Arts scale while students in the Colleges of Earth and Mineral Sciences, Engineering, and Science tend

to be high on the Math, Physical Science, and Engineering scales. Science students are also relatively high on the Life Sciences scale. Students in Liberal Arts are high on the Human Relations Management, Law, and Author-Journalism scales; while Business students are high on the Finance, Business, and Law scales. Similar relationships can be demonstrated in Table 3 for women.

Insert Tables 4 and 5 about here

Stepwise Discriminant Analysis

Tables 4 and 5 present the results of the stepwise discriminant analysis for males and females respectively. Twenty-three steps were required to identify the 23 variables contributing to discrimination among the colleges for males while 22 steps were required to identify 20 variables for women. In the latter case as shown in Table 5, the Elementary Education scale was removed in the twentieth step after having been initially entered in the fifth step.

For both males and females, discrimination among colleges is quite good as evidenced by a Wilks' Lambda of .20 in each case. After about the fourteenth step for both males and females, however, the additional contribution of each variable becomes rather small.

Another feature of Tables 4 and 5 is the relative importance of the intellective measures in the prediction of choice of college. For men the math score of the SAT is entered at step seven and the verbal score at step 16. For women, however, only the math score makes an "independent"

contribution to inter-college discrimination and is not entered until the fifteenth step. These results together with data reported by Berdie (1955) and Baggaley and Campbell (1967) support the notion that vocational interests tend to be more predictive of vocational choice than ability or aptitude measures, at least among college students.

Separation of Colleges

How well these variables distinguish among the colleges can be seen in Table 6 for both males and females. The values in the tables are based

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Insert Table 6 about here

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on the generalized distance measure (D^2) of the vector of means for each pair of groups. For males the largest separation occurs between Engineering and Liberal Arts with large differences also occurring between Agriculture and the Colleges of Business, Engineering, and Liberal Arts. The College of Science is also clearly distinguished from Business, Engineering, and Liberal Arts. Human Development and Education-Health and Physical Education are not separated from the other colleges by large values partly due to the small size of these groups.

For females, the largest separation occurs between Science and Liberal Arts with large differences also occurring with the comparison of Agriculture and Earth and Mineral Sciences-Engineering with Liberal Arts, and Science with Human Development, Education, and Arts and Architecture. Health and Physical Education is not clearly distinguishable from the other colleges partly because of its small size.

Classification Phase

Having identified a set of variables that maximally discriminates among colleges, the next step involves calculation of classification functions for each group to be used in predicting group membership. These functions contain a constant that adjusts for group deviations from the grand mean for each included variable as well as for the prior probability of group membership based here on the proportion of the sample in each college. In addition, each variable is weighted by a constant in a way that reflects its variation as well as its covariation with respect to the other variables in the function. With one function defined for each group, the vector of scores for each subject is used in each of nine functions to yield a set of nine discriminant scores. These scores are equated to posterior probabilities and each subject is classified into the group identified as being most probable (i.e., with the smallest discriminant score). The a priori classification of subjects can be compared with this posterior classification to get an indication of the predictive efficiency of the classification functions. These results for males and females are presented in Table 7 and Table 8, respectively. The cross-classification of subjects using the jackknifed classification functions is also presented in these tables.

Insert Tables 7 and 8 about here

Before proceeding to a discussion of Tables 7 and 8, it should be noted that the use of prior probabilities in the classification functions weights the prediction of group membership in favor of the larger groups.

This tendency is particularly strong when using the jackknifed classification functions. In the present study, since the groups vary considerably in size and since prior probabilities are used, the percentage of "hits" is anticipated to be relatively small in the smaller groups.

In Table 7, over 60 percent of the male students are correctly classified by college. The percentage of hits ranges from a high of 82 percent for Engineering to 15.9 percent for Arts and Architecture. In the latter group, it seems clear that several distinct subgroups may be present. Over 45 percent were classified into Engineering, probably a reflection of the proportion of students enrolling in architecture or landscape architecture in that group. The students majoring in creative or performing arts may not be clearly distinguishable from the students in Liberal Arts. In a similar way, a large number of Earth and Mineral Science students are classified into Engineering and a smaller but sizeable number into Science. This may reflect the mix of students with interests in petroleum and natural gas and mining engineering, on one hand, and geosciences, on the other, or perhaps an interest in applied versus basic science. This same dimension may also account for the number of Agriculture students classified into Science. The jackknifed classification for men resulted in a 56.4 percent hit rate, indicating substantial stability in a cross-validation sense. As expected, the shrinkage of hits is largest for the smaller groups and much smaller for the four largest groups.

As shown in Table 8, the hit rate for women overall is 60 percent and ranges from 77.4 percent for Liberal Arts to 17.4 percent for Health

and Physical Education. Most groups appear reasonably distinct with several exceptions. A substantial number of Agriculture students are classified into Science; a relatively large proportion of Human Development students are classified into Liberal Arts; and nearly one third of the Health and Physical Education students are classified into Education.

But rather than representing a failure of the JVIS to predict college membership, these results may simply reflect the presence of overlap and the lack of homogeneity among the academic programs offered in these colleges. To some extent, these results also reflect the weight given to the prior probability of group membership (i.e., group size) in the classification functions. This latter phenomenon is illustrated quite well in the jackknifed classification where the two largest groups have a larger number of students classified into them than was true of the classification functions based on the full sample. The smaller groups, however, all have fewer students assigned. As with the results for men, the jackknifed classification for women shows a relatively small decrease in the overall hit rate indicating that the classification functions are rather stable in a cross-validation sense.

For both men and women, the predictive efficiency of the classification functions seems quite high since the proportion of hits is considerably larger than would be predicted from chance alone. For men only about 34 percent would have had college enrollment correctly predicted by chance and for women this figure is about 31 percent. The nearly 61 percent hit rate for men and the 60 percent hit rate for women represents an improvement over chance of nearly 50 percent.

Description of Canonical Variates

To this point the analysis has concentrated on the classification phase of discriminant function analysis. But the classification phase does not reveal the way in which variables contribute to group separation. This descriptive information is developed from a slightly different method of summarizing the data. While classification analysis involves the calculation of a function associated with each group, discriminant analysis is concerned with determining the characteristic roots and vectors of the matrix product of the between groups variance-covariance matrix and the inverse of the within groups or common error variance-covariance matrix. The values in each characteristic vector are then used to define a linear function of the variables that represents a dimension along which the groups differ. Where K is the number of groups, K - 1 of these functions can be calculated, each being orthogonal to every other function defined on the entire independent variable set and across all groups. Of the eight possible linear discriminant functions, the first two accounted for over 69 percent and 65 percent of the total variation for men and women respectively. Consequently only these two functions are described here.

The most appropriate way to approach describing the content of these canonical variables or dimensions is not clear (see Huberty, 1975). Both standardized coefficients and variable-canonical variate correlations are commonly used though neither is established as clearly superior. Both of these sets of data were examined in this study and the variable-canonical variate correlations were found to offer more clearly defined psychological dimensions. These data are presented in Table 9 for both men and women.

Insert Table 9 about here

For men, the first canonical variate seems to represent a dimension defined on one end by the Math, Physical Science, and Engineering scales and on the other by the Teaching, Human Relations Management, Law, and Author-Journalism scales, suggestive of a science versus non-science continuum. The second canonical variate has high positive correlations with the Life Science, Medical Service and, to some extent, the Physical Science scales. Clearly this dimension is another kind of science versus non-science continuum, but one which contrasts an interest in biological sciences with an interest in business and finance.

The first canonical variate for women seems similar to the first one for men except that in addition to the Math, Physical Science and Engineering scales, the Medical Service and Life Sciences scales also have large negative correlations. Similarly, those variables with relatively large positive correlations seem to reflect a stronger business orientation than is true of men. Both the Sales and Business scales have relatively large positive correlations. The Technical Writing scale also has a relatively large positive correlation with the first canonical variate for women.

The second canonical variate for women has few large positive or negative correlations with the variables. This reflects the fact that only about 15 percent of the total variation is accounted for by this factor, while the first function accounts for nearly 50 percent of the total variation. It is still interesting to note that both the Medical Service and

Life Science scales are positively correlated with canonical variate II, and the Math and Engineering scales have a negative correlation. Considering other variables with relatively large correlations, the second canonical variate for women represents a biological science, writing and teaching versus an engineering, math and creative arts dimension. The psychological meaning represented in this dimension is not entirely clear. It seems to represent a dimension of interests merged across science and non-science lines.

Just how these canonical variates discriminate among colleges can be seen by plotting the college means in the two dimensional Euclidean space defined by the first two variates. It should be recognized that even though it is common practice to plot these dimensions at right angles, they are actually correlated by a small amount (Tatsuoka, 1971, p. 169). In spite of this fact, plotting the group means in Euclidean space does not introduce an important amount of distortion. College means on the first two canonical variates are plotted in Figures 1 and 2 for men and women respectively.

Insert Figures 1 and 2 about here

The first canonical variate in Figure 1 arrays the college means in a way that is in consonance with the pattern of variable-canonical variate correlations. The colleges with a focus on non-science programs have means with a relatively large positive projection on this dimension while the projection of the Engineering group mean is large and negative. The colleges with a natural or physical science emphasis have means with

projections near zero on this dimension as does the College of Arts and Architecture. The second dimension reflects a natural or physical science-business continuum as indicated by canonical variate-variable correlations. It is not surprising that the Science and Agriculture group means have relatively large positive projections on this dimension while the Business mean has a large negative projection.

In the plots of college means for women in Figure 2, the first canonical variate clearly accounts for variation between college means and places projections of the college means along the science versus non-science continuum. The second canonical variate discriminates mainly between Agriculture, on one hand, and Engineering-Earth and Mineral Sciences and Arts and Architecture on the other. As mentioned earlier, the presence of Arts and Architecture on this dimension seems to be an indication that architecture and/or landscape architecture students may constitute a large proportion of that group.

Conclusions and Implications

These data seem to give adequate support to the assertion that the JVIS possesses considerable validity. In spite of the fact that the groups used here are only loosely defined and in fact have considerable overlap in the programs they offer, the subset of JVIS scales identified in the stepwise discriminant procedure discriminated among the colleges in what seems to be a systematic and orderly way. In a preliminary sense, the JVIS scales possess considerable predictive efficiency as well. The results obtained in this study compare favorably with the results reported by Borgen (1972) on the SVIB, as well as the studies reported by Stahmann

(1969) and Baggaley and Campbell (1967). Further, this study seems to indicate a higher level of predictive efficiency than has been obtained with the VPI or SDS (Scott and Sedlacek, 1975; Gottfredson and Holland, 1975; Holland, 1968, 1963, 1962).

It seems reasonable to conclude, then, that the JVIS offers considerable promise as an addition to the tools available to vocational counselors. Of course, this study used college freshmen and so is limited in generality. Additional studies need to be done on high school students and perhaps adults in order to assess what limitations, if any, exist in the populations to which the JVIS scales are well suited.

A number of other studies are needed to fully explore the potential of the JVIS as a counseling tool. Several studies in this area are planned for the sample used in this study. One of these will examine the relationship of freshman JVIS scores to changes in major program. Another study will attempt to use JVIS scales to cluster students in terms of their seventh term major course of study. It is possible that a more internally consistent grouping of majors may be one result of this effort. Still another study will attempt to relate major at graduation to freshman JVIS scores. At this stage of the research program, successful students will be identified and an attempt will be made to predict their major at graduation from their freshman JVIS scores. One product of this or other studies will be a body of data that can be used to counsel entering freshmen on what major or group of majors they might find most in line with their interests.

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Footnote

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Table 1

Sample and Fall 1974 Enrollment

Frequency Distribution by College

College	Men			Women		
	Enrollment	Expected N	Sample N	Enrollment	Expected N	Sample N
AG	7.9%	78	74	7.1%	57	62
AA	4.8%	48	44	7.1%	57	54
BUS	8.7%	86	82	3.5%	28	30
EMS	5.8%	57	74	0.7%	6	3
EDUC	1.8%	18	10	9.7%	77	67
ENGR	32.0%	317	334	4.6%	37	39
HPE	1.3%	13	7	4.2%	33	23
HDEV	2.7%	27	20	10.2%	81	91
LA	14.4%	143	141	32.8%	261	248
SCI	20.6%	204	205	20.1%	160	180
Total	100.0%	991	991	100.0%	797	797
χ^2		14.879			11.393	

Note. $\chi^2_{9,.05} = 16.919$

Table 2

Mean JVIS Scale Scores and Standard Deviations

by Initial Choice of Academic College for Males

College		JVIS Scale																	
		C ARTS	P ARTS	MATH	P SCI	ENGR	L SCI	B SCI	ADVENT	NAT-AG	SK TRDS	P SERV	PAM ACT	MED SERV	LDSHP	JB SEC	STAM	RESP	TCHNG
AG	M	9.82	7.55	9.27	11.35	11.05	12.86	10.04	13.15	13.30	6.30	6.80	9.73	10.34	6.27	7.86	11.50	12.68	7.22
N = 74	SD	3.65	3.77	4.45	3.97	3.48	3.82	2.87	2.88	3.23	3.72	2.80	3.25	4.62	3.49	3.68	2.92	2.26	2.64
AA	M	11.16	9.16	9.11	8.61	10.80	8.70	9.68	11.34	8.77	5.36	6.75	9.34	5.25	5.84	7.57	9.91	11.61	8.09
N = 44	SD	3.77	4.01	4.49	3.71	4.12	3.82	3.31	3.88	3.63	3.50	3.27	3.99	4.29	3.81	3.87	4.15	3.15	3.07
BUS	M	6.73	7.26	7.73	6.88	7.83	5.82	7.89	10.43	5.50	3.90	6.28	7.12	4.88	6.26	7.04	8.15	11.06	8.60
N = 82	SD	3.70	3.19	4.00	3.76	3.21	3.34	2.72	3.88	3.35	3.29	2.78	3.53	3.52	3.27	3.13	3.40	3.10	3.60
EMS	M	8.31	8.05	10.62	13.38	12.30	11.14	9.65	12.85	9.05	5.77	6.45	8.07	8.22	6.77	7.91	9.07	12.26	7.62
N = 74	SD	4.05	3.77	4.23	3.02	3.11	3.88	2.92	3.82	4.21	3.61	2.80	3.51	4.77	3.75	3.82	3.43	3.02	3.16
ED-HPE	M	8.71	8.82	7.18	5.88	7.35	7.12	9.35	12.00	7.59	5.06	8.12	10.41	6.94	6.47	6.82	8.24	10.24	11.12
N = 17	SD	2.59	3.09	4.69	2.74	3.48	4.33	3.10	3.71	2.81	2.61	2.50	2.90	3.72	3.61	2.77	3.83	2.41	3.60
ENGR	M	9.37	7.65	12.96	12.54	13.45	10.09	8.86	12.69	8.40	6.87	7.04	9.09	7.51	6.89	8.35	10.52	12.10	6.39
N = 334	SD	3.85	3.30	3.22	3.33	2.73	4.03	3.17	3.41	4.09	3.93	2.77	3.45	4.49	3.55	3.56	3.19	2.62	2.93
HDEV	M	7.10	8.00	5.65	7.40	7.70	8.00	8.30	12.60	8.55	5.10	7.10	8.05	7.40	7.55	7.60	8.90	11.95	9.30
N = 20	SD	3.43	2.79	5.16	3.86	4.16	4.84	3.28	3.57	4.56	2.51	2.00	3.60	4.19	3.03	2.82	3.21	2.80	2.92
LA	M	7.85	9.19	6.98	6.97	7.18	7.67	9.82	11.01	6.90	3.79	6.28	6.89	7.06	5.51	6.04	8.23	10.00	9.63
N = 141	SD	3.85	3.71	4.28	3.81	3.67	4.00	3.19	3.92	3.83	3.24	2.80	3.64	4.54	3.32	3.14	3.45	3.03	3.06
SCI	M	8.68	8.08	11.56	12.42	11.10	12.25	9.80	12.63	8.24	4.94	6.35	7.89	11.98	6.19	7.35	10.62	11.86	7.44
N = 205	SD	3.85	3.40	4.34	3.35	3.32	3.66	3.67	3.18	4.08	3.29	2.77	3.42	4.71	3.33	3.47	3.04	2.88	2.78
TOTAL	M	8.77	8.04	10.52	10.84	11.00	9.97	9.29	12.23	8.33	5.53	6.67	8.35	8.31	6.40	7.56	9.89	11.67	7.62
N = 991	SD	3.92	3.51	4.62	4.29	3.99	4.39	3.27	3.60	4.25	3.73	2.80	3.61	4.98	3.49	3.54	3.44	2.91	3.22

Table 2

Mean JVIS Scale Scores and Standard Deviations

By Initial Choice of Academic College for Males (Continued)

College		JVIS Scale																	
		SOC SERV	EL. ED	FIN	BUS	OFC WK	SALES	SUPER	HUM REL	LAW	P ADV	AUTH-JOURN	AC ACH	TECH WRTNG	INDEP	PLAN	SELF CONF	SAT M	SAT V
AG	M	6.15	5.91	6.05	6.57	4.74	5.31	5.77	7.45	6.81	6.69	6.35	9.09	5.73	9.38	8.91	10.16	581.4	524.5
N = 74	SD	3.74	3.16	3.39	2.73	2.75	2.37	2.87	3.21	3.16	2.83	3.37	2.76	2.06	2.93	3.18	2.95	74.6	77.6
AA	M	7.36	7.61	7.41	8.39	5.43	7.89	7.30	9.20	8.23	8.02	8.82	8.68	6.25	10.70	8.61	11.39	596.8	521.1
N = 44	SD	4.48	3.82	3.77	2.77	2.41	2.86	3.20	3.30	3.53	2.28	4.42	2.93	3.02	2.78	3.60	2.76	82.5	91.1
BUS	M	6.84	6.48	13.04	11.01	7.59	9.49	10.70	10.91	12.34	10.91	8.38	9.95	7.23	10.61	10.41	12.33	598.8	515.1
N = 82	SD	4.04	3.16	3.00	2.98	3.27	3.34	3.43	3.76	3.69	2.95	3.41	3.04	2.82	2.83	3.04	2.97	68.7	63.2
EMS	M	6.15	6.61	7.77	7.47	5.69	5.91	6.85	8.89	7.97	7.85	7.64	8.81	5.78	8.67	8.62	10.03	614.6	540.8
N = 74	SD	3.87	3.24	3.25	2.26	3.33	2.76	2.95	3.10	2.89	2.35	3.15	3.06	2.40	2.76	3.31	3.18	66.2	74.6
ED-HPE	M	10.94	10.59	6.52	8.76	6.59	7.65	7.41	11.06	8.06	8.29	9.65	9.06	7.29	9.18	8.88	10.71	514.1	450.0
N = 17	SD	4.35	3.45	2.92	2.61	2.58	2.55	2.83	2.83	3.13	1.72	2.55	2.93	2.02	3.26	2.45	3.74	89.2	86.3
ENGR	M	5.31	5.32	7.84	7.41	5.96	6.28	7.53	8.03	7.85	7.60	6.57	8.80	5.41	9.01	8.90	10.01	617.5	510.2
N = 334	SD	3.72	3.18	3.77	2.64	2.84	2.64	3.25	3.25	3.57	2.90	3.31	3.16	2.61	3.09	3.15	2.99	72.1	79.9
HDEV	M	9.00	7.65	8.10	8.95	7.05	9.20	9.05	9.80	10.95	8.20	7.85	8.95	6.50	8.80	9.80	11.95	534.8	498.0
N = 20	SD	4.32	3.36	3.93	2.74	3.65	3.75	3.39	2.40	3.62	2.26	4.69	3.10	2.37	3.33	3.25	3.03	82.4	61.2
LA	M	9.26	7.88	9.11	8.59	5.69	8.11	8.13	11.62	11.47	9.71	11.36	10.46	8.68	10.65	8.62	11.89	588.1	550.1
N = 141	SD	4.13	3.53	3.98	3.06	3.04	3.34	3.51	3.13	3.47	2.76	3.84	3.11	3.14	2.89	3.57	2.98	83.8	82.6
SCI	M	7.53	6.38	6.74	6.45	5.05	5.60	6.42	8.34	8.17	7.21	7.20	9.68	6.16	9.51	8.40	10.34	625.3	547.3
N = 205	SD	4.11	3.08	3.38	2.37	2.91	2.42	3.01	3.02	3.12	2.52	3.46	2.65	2.66	2.85	3.1[illegible]	2.60	72.2	81.3
TOTAL	M	6.84	6.38	8.05	7.72	5.77	6.72	7.49	9.01	8.82	8.09	7.77	9.34	6.32	9.56	8.87	10.66	606.1	526.5
N = 991	SD	4.21	3.41	3.97	2.93	3.02	3.06	3.41	3.48	3.78	2.95	3.85	3.04	2.88	3.02	3.25	3.03	77.1	81.3

Table 3

Mean JVIS Scale Scores and Standard Deviations

By Initial Choice of Academic College for Females

College		JVIS Scale																	
		C ARTS	P ARTS	MATH	P SCI	ENGR	L SCI	B SCI	ADVENT	NAT-AG	SK TRDS	P SERV	FAM ACT	MED SERV	LDSHP	JB SEC	STAM	RESP	TCHNG
AG	M	11.59	7.79	8.27	10.26	7.76	13.71	10.69	12.19	13.34	4.82	8.29	11.13	12.19	4.34	7.18	10.77	11.79	8.40
N = 62	SD	3.18	3.55	4.32	3.85	3.41	3.00	2.29	2.30	2.35	3.30	3.27	3.35	4.58	3.01	3.89	3.24	2.44	2.76
AA	M	14.20	10.81	7.42	7.43	8.07	8.40	10.65	10.91	9.26	4.93	9.33	12.41	5.57	4.11	6.24	9.33	10.85	8.39
N = 54	SD	2.71	3.74	4.60	4.21	3.91	3.64	2.91	3.97	3.97	3.10	2.84	2.91	4.32	3.01	3.23	3.39	2.62	2.57
BUS	M	7.67	7.13	7.10	4.47	4.67	5.27	8.30	9.00	5.30	3.10	8.37	9.63	4.10	4.80	7.37	7.73	11.37	9.87
N = 30	SD	4.05	3.38	4.36	3.33	2.83	3.59	3.15	3.78	3.68	2.76	3.29	3.94	3.64	2.64	3.20	3.55	2.88	3.21
ENG-EMS	M	11.57	7.76	12.93	11.95	12.45	10.64	10.19	11.83	9.00	5.55	7.95	10.17	7.83	4.38	7.36	10.76	12.57	6.95
N = 42	SD	3.91	3.75	3.83	3.86	3.37	3.47	2.72	2.90	3.49	3.67	2.92	3.70	4.98	3.31	3.99	3.57	2.64	2.70
ED	M	10.61	8.30	6.60	5.52	5.01	7.75	10.09	9.19	7.51	4.24	8.88	11.19	6.04	4.46	7.22	7.49	11.10	12.31
N = 67	SD	3.65	3.40	4.34	3.11	3.10	3.80	3.09	3.45	3.50	2.77	3.09	3.28	4.28	2.88	3.46	2.92	2.76	2.80
HPE	M	11.04	8.43	6.74	6.48	6.39	8.83	10.64	9.61	8.78	3.91	9.65	11.26	7.70	4.35	7.13	9.00	11.74	10.70
N = 23	SD	4.15	3.67	4.56	3.07	3.59	3.02	3.47	4.49	4.38	2.04	3.14	3.79	4.13	2.76	4.39	3.22	2.96	3.50
HDEV	M	9.84	7.52	5.13	5.11	4.67	7.40	10.41	9.10	7.80	3.69	9.16	10.68	6.35	4.67	6.60	8.34	10.86	10.31
N = 91	SD	3.42	3.43	4.02	2.96	2.93	3.92	3.15	3.57	3.73	2.85	3.45	3.83	4.79	2.97	3.59	3.26	2.98	2.92
LA	M	9.60	9.04	5.21	5.50	4.98	7.46	11.08	9.39	7.28	3.17	7.49	8.67	5.43	4.40	5.97	7.94	10.20	10.41
N = 248	SD	3.55	3.49	3.66	3.51	3.11	3.64	2.94	3.79	4.07	2.67	3.31	3.63	4.30	2.90	3.29	3.16	2.89	2.88
SCI	M	10.57	8.21	10.68	10.79	8.26	12.31	10.72	10.93	9.14	4.34	7.70	10.75	11.75	4.97	7.47	9.90	11.68	7.83
N = 180	SD	3.45	3.18	4.25	3.74	3.37	3.88	2.98	3.64	4.47	3.41	3.14	3.46	4.89	2.87	3.70	3.37	2.55	3.05
TOTAL	M	10.47	8.48	7.46	7.48	6.54	9.24	10.61	10.13	8.44	3.97	8.15	10.22	7.69	4.55	6.76	8.88	11.07	9.49
N = 797	SD	3.72	3.53	4.77	4.38	3.84	4.40	2.99	3.79	4.28	3.08	3.27	3.71	5.33	2.92	3.59	3.43	2.83	3.25

Table 3

Mean JVIS Scale Scores and Standard Deviations

By Initial Choice of Academic College for Females (continued)

College		JVIS Scale																	
		SOC SERV	EL ED	FIN	BUS	OFC WK	SALES	SUPER	HUM REL	LAW	P ADV	AUTH-JOURN	AC ACH	TECH WRTNG	INDEP	PLAN	SELF CONF	SAT M	SAT V
AG	M	9.66	8.06	4.08	6.23	4.68	5.13	4.66	7.71	6.27	6.02	7.58	9.65	6.74	8.90	7.84	10.77	550.3	540.6
N = 62	SD	3.47	3.34	2.73	2.60	2.74	2.29	2.57	3.10	2.90	2.78	3.66	2.44	2.07	3.00	2.92	3.28	69.6	74.0
AA	M	10.11	9.39	5.61	7.65	5.54	6.39	5.81	8.15	7.41	7.48	10.17	9.57	6.87	10.35	8.41	11.50	569.3	539.8
N = 54	SD	3.68	3.52	3.59	2.59	3.44	2.98	2.83	2.95	3.47	2.80	3.64	2.85	2.12	2.53	2.86	2.96	83.1	87.9
BUS	M	10.40	9.53	11.70	10.40	8.70	8.07	9.97	11.07	11.17	10.80	9.13	10.50	8.10	9.90	10.43	13.70	572.7	522.3
N = 30	SD	3.77	3.71	4.13	2.74	3.66	2.99	3.16	3.51	3.83	2.59	4.26	2.62	2.40	2.83	3.22	1.91	70.1	66.0
ENG-EMS	M	7.52	7.19	6.43	6.26	5.98	4.86	5.67	7.50	7.33	7.38	6.31	9.40	6.05	8.45	9.64	10.52	607.6	528.6
N = 42	SD	3.84	3.34	3.57	2.29	3.09	2.50	2.66	2.97	3.71	2.24	3.23	2.60	2.54	2.93	3.18	2.97	82.8	84.1
ED	M	13.24	13.34	5.34	8.06	6.82	7.48	6.84	9.18	7.64	8.01	9.70	10.01	8.18	8.97	9.93	12.52	569.3	537.6
N = 67	SD	3.14	3.07	3.07	2.37	3.34	2.97	2.91	2.58	3.48	2.71	4.02	2.72	3.11	3.03	3.36	2.70	68.5	63.1
HPE	M	13.65	11.22	5.65	7.17	6.43	7.30	6.78	8.48	7.30	8.00	8.57	9.43	6.48	8.30	9.65	11.91	535.2	478.7
N = 23	SD	3.11	4.04	3.70	2.74	2.91	2.96	2.75	3.38	4.06	2.75	3.79	3.06	2.63	2.93	4.30	2.86	76.4	86.9
HDEV	M	12.44	10.55	7.02	9.21	7.07	8.23	8.25	10.47	8.98	9.46	9.14	9.97	7.60	9.50	9.66	13.11	539.2	514.3
N = 91	SD	3.50	3.28	3.46	2.69	3.23	2.89	2.69	2.83	3.69	2.47	3.63	2.49	3.12	2.84	3.09	2.47	66.2	76.9
LA	M	11.36	9.70	7.33	8.71	6.58	7.29	7.43	10.97	10.69	9.75	11.94	10.95	9.71	10.95	8.91	12.76	535.2	545.8
N = 248	SD	3.66	3.42	3.86	2.72	3.14	3.20	2.97	3.27	3.88	2.78	3.57	2.59	2.92	2.91	3.41	2.85	72.9	75.8
SCI	M	9.62	8.15	4.94	6.79	5.79	5.23	7.39	7.75	7.42	6.90	7.68	9.59	6.85	8.90	8.34	11.10	583.7	535.9
N = 180	SD	4.02	3.28	3.19	2.69	3.20	2.60	2.89	3.49	3.64	2.71	3.77	2.49	2.95	2.79	3.45	2.88	71.3	70.1
TOTAL	M	10.86	9.51	6.29	7.90	6.30	6.61	6.67	9.34	8.68	8.35	9.51	10.11	7.92	9.70	8.95	12.06	558.2	534.7
N = 797	SD	3.94	3.68	3.81	2.87	3.27	3.10	3.12	3.49	4.00	3.03	4.12	2.65	3.10	3.00	3.37	2.96	75.7	75.8

Table 4

Summary of Stepwise Discriminant Function Analysis

For Males

Step no.	Variable entered	F Statistic[a] to enter	Wilks' Lambda
1	5. ENGR	65.15	.65
2	13. MED SERV	30.33	.52
3	9. NAT-AG	18.21	.46
4	4. P SCI	16.09	.40
5	21. FIN	12.87	.36
6	29. AUTH-JOURN	8.99	.34
7	SAT M	7.43	.32
8	6. L SCI	6.07	.30
9	30. AC ACH	6.16	.29
10	3. MATH	5.13	.28
11	27. LAW	4.18	.27
12	1. C ARTS	3.97	.26
13	20. EL ED	3.87	.25
14	22. BUS	3.79	.24
15	16. STAM	3.08	.24
16	SAT V	2.79	.23
17	25. SUPER	2.96	.23
18	14. LDSHP	2.79	.22
19	17. RESP	2.66	.22
20	32. INDEP	2.70	.21
21	26. HUM REL	2.47	.21
22	34. SELF CONF	2.40	.20
23	18. TCHNG	2.06	.20

[a]Degrees of freedom for the F to enter vary between 8,983 for step one and 8,960 for step 23.

Table 5

Summary of Stepwise Discriminant Function Analysis

For Females

Step no.	Variable		F Statistic[a]		Wilks' Lambda
	Entered	Removed	To Enter	To Remove	
1	4. P SCI		52.68		.65
2	13. MED SERV		18.17		.55
3	5. ENGR		13.40		.48
4	31. TECH WRTNG		11.83		.43
5	20. EL ED		10.34		.39
6	9. NAT-AG		10.11		.35
7	1. C ARTS		8.00		.33
8	3. MATH		6.19		.31
9	21. FIN		5.33		.29
10	2. P ARTS		4.97		.28
11	32. INDEP		4.06		.27
12	7. B SCI		3.50		.26
13	6. L SCI		3.55		.25
14	18. TCHNG		3.47		.24
15	SAT M		3.19		.23
16	27. LAW		2.76		.23
17	16. STAM		2.36		.22
18	24. SALES		2.44		.21
19	19. SOC SERV		2.30		.21
20		20. EL ED		1.45	.21
21	22. BUS		2.11		.21
22	12. FAM ACT		2.28		.20

[a]Degrees of freedom for the F to enter vary between 8,788 for step one and 8,768 for step 22.

Table 6

Generalized Distance Measures (D^2)

Between Each Pair of Colleges

Expressed as F Statistics

College	Males[a]							
	AG	AA	BUS	EMS	ED-HPE	ENGR	HDEV	LA
AA	5.12							
BUS	13.17	5.28						
EMS	7.07	5.19	10.57					
ED-HPE	5.34	2.94	4.69	5.35				
ENGR	13.51	4.78	14.86	5.20	6.39			
HDEV	3.22	2.89	2.80	3.92	1.88	5.50		
LA	13.14	6.00	8.25	13.09	3.01	29.98	2.48	
SCI	8.27	8.11	17.28	6.28	6.07	18.15	4.61	16.98

College	Females[b]							
	AG	AA	BUS	EMS-ENGR	EDUC	HPE	HDEV	LA
AA	9.98							
BUS	9.42	6.61						
EMS-ENGR	8.86	6.27	7.34					
EDUC	10.03	6.86	5.23	10.63				
HPE	4.12	2.92	3.58	4.90	1.28[c]			
HDEV	9.05	6.37	3.43	11.49	3.49	1.35[c]		
LA	15.17	8.63	5.08	15.44	7.68	3.80	5.44	
SCI	5.61	11.95	9.24	6.81	12.12	4.88	14.41	28.51

[a]All F statistics have 23 and 960 degrees of freedom and are calculated using the 23 variables selected in the stepwise disciminant analysis. All values are significant beyond the .01 level.

[b]All F statistics have 20 and 769 degress of freedom and are calculated using the 20 variables selected in the stepwise disciminant analysis.

[c]Not statistically significant. All other values are statistically significant beyond the .01 level.

Table 7

Classification Matrix for Men

College	N	% correct	Number (percent) classified into								
			AG	AA	BUS	EMS	ED-HPE	ENGR	HDEV	LA	SCI
Total Sample Classification											
AG	74	44.6	33(44.6)	2(2.7)	1(1.4)	3(4.1)	1(1.4)	12(16.2)	2(2.7)	2(2.7)	18(24.3)
AA	44	15.9	2(4.5)	7(15.9)	4(9.1)	2(4.5)	1(2.3)	20(45.5)	0(0.0)	7(15.9)	1(2.3)
BUS	82	50.0	2(2.4)	0(0.0)	41(50.0)	2(2.4)	1(1.2)	18(21.9)	0(0.0)	14(17.1)	4(4.9)
EMS	74	27.0	4(5.4)	0(0.0)	1(1.4)	20(27.0)	0(0.0)	30(40.5)	1(1.4)	3(4.1)	15(20.3)
ED-HPE	17	47.1	0(0.0)	0(0.0)	1(5.9)	0(0.0)	8(47.1)	3(17.6)	0(0.0)	5(29.4)	0(0.0)
ENGR	334	82.0	7(2.1)	4(1.2)	9(2.7)	4(1.2)	0(0.0)	274(82.0)	0(0.0)	9(2.7)	27(8.1)
HDEV	20	25.0	2(10.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	6(30.0)	5(25.0)	6(30.0)	1(5.0)
LA	141	66.0	4(2.8)	5(3.5)	12(8.5)	0(0.0)	2(1.4)	9(6.4)	2(1.4)	93(66.0)	14(9.9)
SCI	205	60.0	11(5.4)	0(0.0)	3(1.5)	4(2.0)	0(0.0)	49(23.9)	1(0.0)	14(6.8)	123(60.0)
TOTAL	991	60.9	65	18	72	35	13	421	11	153	203
Jackknifed Classification											
AG	74	40.5	30(40.5)	2(2.7)	1(1.6)	3(4.6)	1(1.6)	13(17.6)	2(2.7)	3(4.6)	19(25.6)
AA	44	9.1	2(4.5)	4(9.1)	4(9.1)	2(4.5)	1(2.3)	23(52.0)	0(0.0)	7(15.9)	1(2.3)
BUS	82	46.3	2(2.4)	0(0.0)	38(46.3)	2(2.4)	1(1.2)	19(23.2)	0(0.0)	16(19.5)	4(4.9)
EMS	74	17.6	4(5.4)	0(0.0)	2(2.7)	13(17.6)	0(0.0)	33(44.6)	1(1.6)	4(5.4)	17(23.0)
ED-HPE	17	23.5	0(0.0)	0(0.0)	1(5.9)	0(0.0)	4(23.5)	3(17.6)	0(0.0)	9(53.0)	0(0.0)
ENGR	334	80.2	7(2.1)	5(1.5)	10(3.0)	4(1.2)	0(0.0)	268(80.2)	0(0.0)	10(3.0)	30(9.0)
HDEV	20	10.0	2(10.0)	0(0.0)	1(5.0)	0(0.0)	1(5.0)	7(35.0)	2(10.0)	6(30.0)	1(5.0)
LA	141	61.7	4(2.8)	6(4.3)	13(9.2)	0(0.0)	4(2.8)	10(7.1)	1(0.7)	87(61.7)	16(11.3)
SCI	205	55.1	11(5.4)	0(0.0)	4(2.0)	4(2.0)	0(0.0)	55(26.8)	1(0.5)	17(8.3)	113(55.1)
TOTAL	991	56.4	62	17	74	28	12	431	7	159	201

Table 8

Classification Matrix for Women

College	N	% correct	Number (percent) classified into								
			AG	AA	BUS	EMS-ENGR	EDUC	HPE	HDEV	LA	SCI
Total Sample Classification											
AG	62	38.7	24(38.7)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	3(4.8)	4(6.5)	7(11.3)	24(38.7)
AA	54	53.7	0(0.0)	29(53.7)	0(0.0)	3(5.6)	0(0.0)	1(1.9)	2(3.7)	11(20.4)	8(14.8)
BUS	30	43.3	1(3.3)	0(0.0)	13(43.3)	0(0.0)	0(0.0)	0(0.0)	3(10.0)	10(33.3)	3(10.0)
EMS-ENGR	42	52.4	0(0.0)	2(4.8)	1(2.4)	22(52.4)	1(2.4)	0(0.0)	1(2.4)	6(14.3)	9(21.4)
EDUC	67	55.2	0(0.0)	2(3.0)	1(1.5)	0(0.0)	37(55.2)	0(0.0)	7(10.4)	14(20.9)	6(9.0)
HPE	23	17.4	0(0.0)	1(4.3)	1(4.3)	0(0.0)	7(30.4)	4(17.4)	4(17.4)	4(17.4)	2(8.7)
HDEV	91	22.0	6(6.6)	1(1.1)	0(0.0)	1(1.1)	6(6.6)	1(1.1)	20(22.0)	44(48.4)	12(13.2)
LA	248	77.4	5(2.0)	7(2.8)	6(2.4)	3(1.2)	7(2.8)	0(0.0)	13(5.2)	192(77.4)	15(6.0)
SCI	180	76.1	10(5.6)	2(1.1)	2(1.1)	6(3.3)	5(2.8)	0(0.0)	2(1.1)	16(8.9)	137(76.1)
TOTAL	797	60.0	46	44	24	35	63	9	56	304	216
Jackknifed Classification											
AG	62	33.9	21(33.9)	0(0.0)	0(0.0)	0(0.0)	1(1.6)	3(4.8)	4(6.5)	8(12.9)	25(40.3)
AA	54	37.0	0(0.0)	20(37.0)	1(1.9)	4(7.4)	1(1.9)	1(1.9)	3(5.6)	17(31.5)	7(13.0)
BUS	30	26.7	1(3.3)	0(0.0)	8(26.7)	0(0.0)	1(3.3)	0(0.0)	5(16.7)	12(40.0)	3(10.0)
EMS-ENGR	42	38.1	0(0.0)	2(4.8)	1(2.4)	16(38.1)	1(2.4)	0(0.0)	1(2.4)	6(14.3)	15(35.7)
EDUC	67	41.8	0(0.0)	3(4.5)	2(3.0)	0(0.0)	28(41.8)	1(1.5)	8(11.9)	18(26.9)	7(10.4)
HPE	23	0.0	0(0.0)	1(4.3)	1(4.3)	1(4.3)	8(34.8)	0(0.0)	4(17.4)	5(21.7)	3(13.0)
HDEV	91	17.6	6(6.6)	5(5.5)	0(0.0)	1(1.1)	6(6.6)	1(1.1)	16(17.6)	44(48.4)	12(13.2)
LA	248	73.0	5(2.0)	9(3.6)	8(3.2)	3(1.2)	8(3.2)	0(0.0)	16(6.5)	181(73.0)	18(7.3)
SCI	180	73.9	11(6.1)	2(1.1)	2(1.1)	8(4.4)	6(3.3)	0(0.0)	2(1.1)	16(8.9)	133(73.9)
TOTAL	797	53.1	44	42	23	33	60	6	59	307	223

Table 9

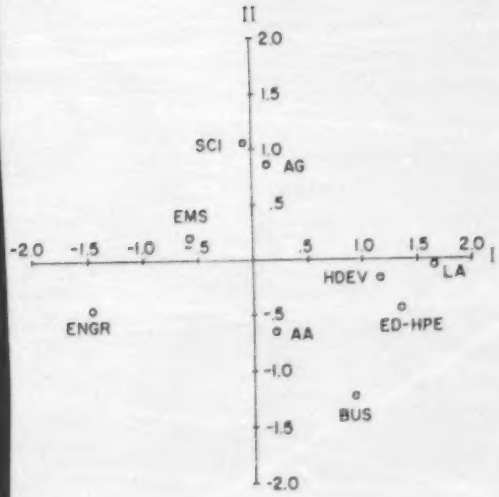
Independent Variable Correlations with Canonical Variables I and II

Males			Females		
Scale	Canonical Variable		Scale	Canonical Variable	
	I	II		I	II
1. C ARTS	-.22	.06	1. C ARTS	-.21	-.34
3. MATH	-.71	.09	2. P ARTS	.11	-.16
4. P SCI	-.78	.40	3. MATH	-.70	-.28
5. ENGR	-.86	.04	4. P SCI	-.82	-.07
6. L SCI	-.39	.65	5. ENGR	-.65	-.48
9. NAT-AG	-.21	.33	6. L SCI	-.74	.29
13. MED SERV	-.13	.73	7. B SCI	.02	.12
14. LDSHP	-.17	-.06	9. NAT-AG	-.40	.18
16. STAM	-.35	.25	12. FAM ACT	-.24	-.18
17. RESP	-.34	.11	13. MED SERV	-.70	.39
18. TCHNG	.53	-.03	16. STAM	-.42	-.07
20. EL ED	.39	.03	18. TCHNG	.54	.21
21. FIN	.27	-.53	19. SOC SERV	.39	.19
22. BUS	.34	-.56	21. FIN	.40	-.16
25. SUPER	.21	-.49	22. BUS	.50	.03
26. HUM REL	.52	-.24	24. SALES	.49	.03
27. LAW	.53	-.32	27. LAW	.47	.09
29. AUTH-JOURN	.55	-.11	31. TECH WRTNG	.50	.29
30. AC ACH	.25	.07	32. PLAN	.35	-.01
32. PLAN	.28	-.08	SAT M	-.34	-.28
34. SELF CONF	.36	-.17			
SAT M	-.27	.10			
SAT V	.13	.26			

Figure Captions

Figure 1. Canonical variables I and II evaluated at group means-males.

Figure 2. Canonical variables I and II evaluated at group means-females.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1.0
.5
SCI
AG
EMS
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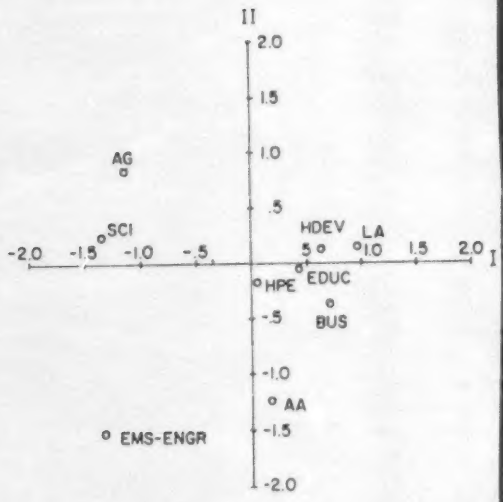
-1.5
-1.0
.5
.5
1.0
1.5
2.0
I
HDEV
LA
ENGR
AA
ED-HPE
-.5
-1.0
-1.5
-2.0
BUS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1.5
1.0
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AG
SCI
HDEV
LA
-2.0
-1.5
-1.0
-.5
.5
1.0
1.5
2.0
I
HPE
EDUC
BUS
-.5
-1.0
AA
EMS-ENGR
-1.5
-2.0